

# FREQUENCIES VHF, UHF, SHF NEWSLETTER

**NZ** This newsletter is compiled by Kevin Murphy ZL1UJG to promote operational and construction activity on the VHF, UHF and SHF Amateur Radio allocations in New Zealand (and overseas).

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**ISSUE 18, SEPTEMBER 2005**

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As mentioned in Issue 13 of the newsletter, there was a terminal illness in close family. After a brave fight with cancer, my Mother, Katharine Estelle Murphy died On Friday 16<sup>th</sup> September, 2005 in Thames, New Zealand.

I dedicate this Issue to her.

There is a Thames Community Cancer Support Group. If one wishes to donate money, please forward to my address at the top of the newsletter. I will then forward any monies received, to the Support group. Thank you

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## **VHF Scene Column July/August, 2005**

Some of you will have noticed that Bob, ZL3TY no longer has his name at the top of the column. He has decided to stop editing the column, after starting in June 1998, after Cliff Betson ZL1MQ passed away. I would like to personally give him a well deserved "Thank You" for his work as the "VHF Scene" columnist over many years.

Bob, ZL3TY wrote these words in his first column in June 1998, and now 7 years later, I repeat them "The column is an important record of what is happening. For the record to be of value it is important that you report your activities. It doesn't need to be much but a note each month (issue) telling me what you have been hearing, working (or any projects) will make my job easier. Your input will also help avoid the subject matter reflecting my own interests and bias."

### **Meteor Scatter**

A report from Bob, ZL3TY:- Regular 2m meteor scatter tests on weekends 8am to 9am Saturday and Sunday are attracting an increasing number of participants, including ZL1BT, ZL1KB, ZL1AOX, ZL1RS, ZL2DX, ZL3NW, ZL3TY and ZL4LV. So far I have worked ZL1BT, ZL1KB and ZL1RS using FSK441A. Tests with ZL2DX using JT65b have resulted in 2 troposcatter QSOs over a distance of 377km, Chris being good copy here running just 30W. Tests will continue each weekend, if interested please contact me to go on my email list, also check the VK-VHF logger ([www.vklogger.com/vhflogger](http://www.vklogger.com/vhflogger)), or 3888 kHz which are used for liaison. Bob's email is [b\\_mcquarrie@minidata.co.nz](mailto:b_mcquarrie@minidata.co.nz)

### **6m**

Murray ZL3MH worked VK4FNQ on 6m in North Queensland at Charters Towers on 22<sup>nd</sup> May at 4.15pm

### **Microwave**

Simon, ZL1SWW used his 2424 MHz transverter, with ~ 3 watts out, during the Brass Monkey contest. He has made a 2424 MHz interdigital filter to further reduce the 2280 MHz Local Oscillator level. See <http://www.qsl.net/g0ory/2.3g/bpf/13bpf.html>. Simon also has info on [www.qsl.net/zl1sww](http://www.qsl.net/zl1sww)

He has recently constructed a 45 element loop Yagi and has about 100mW back from 2.8 to 3 watts out, (~ 14 dB return loss).

The Waikato VHF Group has 2 transverters available for loan. One is for 1296 MHz and the other is 2424 MHz. The power is 0.5 to 1 watt o/p and are typically driven from a FT290 or similar. Antennas are not included, however basic antennas may be constructed. Remember Chris ZL2DX worked 600 km+ with a basic antenna and several QSO's to VK have been done with horn antennas. Contact Kevin ZL1UJG at the email address at the end of the column.

## Contests

During the Brass Monkey contest in early July, Simon, ZL1SWW/p (at PineHill, on Auckland's North Shore) ran 4 bands 2, 70, 23 and 13cm. Best contacts were to Dave ZL1AKW on 23cm SSB, and ZL2KA and ZL2IP at Stratford on 70cm. 2m gave easy contacts to ZL2KA, ZL2IP, ZL1AKW, ZL1TWR and ZL1TAP.

During the same contest Steve, ZL1TPH at Moirs Hill (near Orewa) worked Dave ZL1AKW at 200 km 5/9 on 1296 MHz (very strong with QSB) . Steve also heard Dave working the following stations on 1296 MHz, ZL1AVZ (Te Atatu using a horn antenna), ZL1SWW, ZL1BK (1 watt o/p) and ZL1AOX. A great signal was heard from ZL2KG/ZL2KA Steve Jepson and the team from Mt Egmont on 144 MHz.

Steve ZL1TPH also worked Simon ZL1SWW on 2424 MHz, Ian ZL1AOX on 3400 MHz and Brian ZL1AVZ on 10368 MHz (by reflecting off the Sky Tower). He listened to a QSO between ZL1AVZ to ZL1AOX on 3400 MHz. A very active contest to support the the ZL2KA team on Mt Egmont...

Remember that the <http://groups.yahoo.com/group/zlvhfcontest/> ZL VHF Contest reflector has information on individuals and groups for contests and at other times.

## EME

Nick, ZL1IU worked RN6BN on 2m CW. He was running 100watts to 4 by 12ele VE7BQH Yagis built by Bob ZL1RS and myself. He runs a big station and was at times up to 539 here. No headphones required!

Bob, ZL3TY mentioned that May and June were good months, with 70 QSOs with 59 stations in 22 DXCC entities. Best DX was EA5ZF at 19232km. Many EME stations in Europe, America, Russia, South Africa and Oceania were worked using the JT65 digital mode.

## DX

Nick ZL1IU worked Ross VK2DVZ on the 2nd of April on 2m. Nothing on 70 cm. He has been listening over April/May to CH5A Newcastle Video on 138.275 MHz and hears heaps of MS pings, some lasting up to 30 seconds or more.

He has got the 1296 MHz Yagi down to clean up for the next season and will have to replace the rotator on the other tower with the 2.4 dish and 70cm yagi. He should be back in action for the DX season.

## Satellites

Murray ZL3MH has spent some time on the recently launched Hamsat, as this following report shows. Hamsat is a Mode B low orbit satellite at ~ 635 km, with a Linear Transponder. Input frequency 435.250 MHz (+/- 25 kHz) and output 145.900 MHz (+/- 25 kHz) The transponder is inverting, so the input is usually LSB and the signal down is inverted to USB. There are two linear transponders and both have the same input and output frequencies. The Indian one has a unmodulated carrier on 145.940 MHz and the Dutch has modulated information on 145.860. MHz. Signals from the 1w transponder are S9 over head, S6 to 10 degrees and S3 at 1 or 2 degrees without a preamp.

On the satellites I am running a Icom IC402 on TX to a 2N5946 to a MRF646 and the final PA is two MRF648 transistors giving up to 120w out This feeds 6 metres of Belden 9913 coax to a twenty element DL6WU beam. On RX there is an 11 element beam feeding a BF981 pre amp to an old FDK Multi 2000 transceiver. (This was previously used on AO10 and 13)

For Hamsat I run the IC402 to a 2N5496/ MRF646 PA at 12w. The amp is in the roof of the 2 level house, while the antenna's are on top. I am running the amp on lower volts, using a diode in series with the supply to keep the DC volts to 12v or less. On RX a FTV250 transverter feeds a FT101ZD MK2. No preamp is used. (It may be better to run a low value attenuator or lossy coax between the IC402 and the amplifiers to preserve linearity - Kevin)

For FO-29, I use a 20 element antenna, feeding a 435MHz cavity filter, a pre amp , Microwave Modules RX 435-28 MHz converter to FT101ZD MK2. TX is a IC202s and QQQV06/40 valve amp, 2m cavity filter and 11 element yagi. It is quite a job to change from mode B to J. I will have it all set up so it's easy to change over so I can try FO-29 again.

On Hamsat I have worked ZL1AOX Ian, ZL2AVL Alan, VK3KOS Rob, VK3FI Norm, VK3UH Len, VK3YFL Byron, VK3FGN Noel, VK4JWT John, VK3KAI Peter, ZL2LN Barry, VK3YDK Ken, VK3HV George, VK4ZQ Roy, VK2TS Tony, VK1ZQR Roy, VK4AFL Trevor, VK2ZCD Ian, ZL1DK David, ZL2FNF Julian, VK2AWD David, VK3JT Bill, ZL1HAU Sunny, VK6HK Don, VK2ECW David, VK2TRF Jack, ZL3CU Star, VK3DMW Ken.

My best contact was to Perth Western Australia to VK6HK Don. He had the satellite at 3 degrees while I had it at 1 to 2 degrees. We still managed a contact even at that low angle. Also I do have some surplus crystals for the Hamsat frequencies for the IC402 VXO. I am also interested in a SSTV contact on Hamsat but the Doppler could be a challenge .

(Good report on your VHF/UHF activities, Murray.)

### Preamplifiers

I mentioned in a previous column, how preamplifiers can enhance the readability of incoming signals. However it is important to note, that the optimum point for best sensitivity (lowest noise figure) may not correspond with that of maximum gain. At VHF and UHF, this is most often the case, while in the microwave bands, tuning becomes closer. In the case of microwave preamplifiers, the tuning may be preset due to being part of a PCB layout.

Tuning the preamplifier may be carried out with a number of signal sources. One may use an off air signal, such as a remote beacon or weak Repeater. In the microwave bands, some stations have a marker generator covering a number of bands, or have their own beacon TX.

If one has a signal generator, or access to one through their local club, or other contacts then this may also be used for alignment.

Alignment should be carried out with a weak signal, using your associated Rx in FM mode. Small changes in RF alignment of the preamplifier can show up as greater improvements of the audio, or quietening (when there is no modulation).

The output tuning of the preamplifier corresponds to maximum signal on your receiver, however the input tuning is aligned for minimum noise generated by the device. (Noise matched to the transistor, rather than power matched). Most often the input tuning of VHF/UHF preamplifiers may be low in frequency by 10 to 20 MHz, which provides the best noise performance. The input tuning of some VHF/UHF Preamplifiers is sometimes tuned for a small drop in gain, by increasing the resonating capacitor.

It is important to use the best quality components on the input of the preamplifier, as the losses are a function of the "loaded Q" of the circuit, as well the "unloaded Q" (or Q due to the components, such as L's and C's). It is quite possible for the losses of the circuit to exceed the Noise Figure of the device. (Especially if the tuning is incorrect).

Another method of alignment of preamplifiers, is to use a Noise Figure meter and Noise source, which looks at the difference between having the noise source on and off. If one has a higher noise figure, then the difference is less and vice versa.

The noise figure meters usually cover a number of frequencies, with recent models. however earlier models, covered one band, such as 30 MHz, and relies on converters (or transverters) to cover other bands.

Noise sources can be commercial units, which may keep their accuracy up to the GHz region. However it is relatively easy to homebrew one using SMD techniques. This may be used for comparative measurements.

Some even earlier noise sources, relied on thermionic emission from valves, and noise figures were calculated from ratios of the anode currents. However these have fallen from favour due to stray capacitance causing errors in the upper VHF and UHF bands.

Another method of checking performance of preamplifiers/ converters is to check Ground/ Sky noise ratios. (Point the antenna to the ground and to the sky, but not near the Sun) At 50 MHz and 144 MHz, this method is less accurate due to higher levels of noise from the sky. However at UHF and the microwaves, this is a very powerful technique. If one uses a RX, then the AGC should be disabled, or alternatively use a switchable attenuator. The AF output level may be read on a simple AC voltmeter.

I personally have a Noise Figure meter and Noise source. If you are interested in getting an idea of the Noise Figure of your preamplifier, please contact me.

Thanks for information sent in for the column. I welcome any pictures and information from VHF/UHF field days and any other VHF/UHF related activities. Please send to Kevin, ZL1UJG at [rfman@xtra.co.nz](mailto:rfman@xtra.co.nz)  
I am looking for input for the VHF Scene column. Please send ASAP Cutoff date 10 July, 2005

## END OF VHF SCENE

### 1296 MHz Transverters

Most multiband transceivers stop at the 430 MHz band. There are a number of VHF/UHF transceivers that cover the 1300 MHz band, however the cost of these can be relatively high. An alternative option is fitting a **Transmit RX Converter** or Transverter. The Transverter upconverts the IF transceiver TX signal, while the incoming signal is downconverted and received by the IF transceiver.

Transverters may be acquired 2<sup>nd</sup> hand or new, either prebuilt or in kit form, or even home constructed.

An early Transverter, often mentioned is the MMT1296 made by Microwave Modules of Liverpool England. This firm is no longer in business. The design of that Transverter is about 30 years old. The TX mixer uses 2 transistor single balanced mixer, while the RX mixer uses a two diode balanced mixer. The TX mixer may drift over time (and temperature) so it pays to have these transverters checked on a spectrum analyzer. The earlier versions of this Transverter had 2 bipolar RF stages and were less sensitive than later models. RX gain is excessive and some TX linearity problems are apparent, however they are generally good value for money if acquired. TX power 1 to 2 watts depending on version. The local Oscillator appears to be the source of many of the TX spurious

Other transverters of that generation include SOTA, VHF COMMS and designs from Sweden. A design by Downeast Microwave in the late 1980's used hairpin "U" filters etched on the PCB.

Downeast Microwave and DB6NT both currently produce transverters as kits and possibly prebuilt as well at higher cost. The Downeast Microwave one is either a low power one (~ 50 mW), or includes a power module (~ 20 watts). The DB6NT one has a 1.5 watt power module, however these modules are obsolete, so a redesigned unit may be available. Both these transverters use helical filters. The cost of these two transverters is relatively

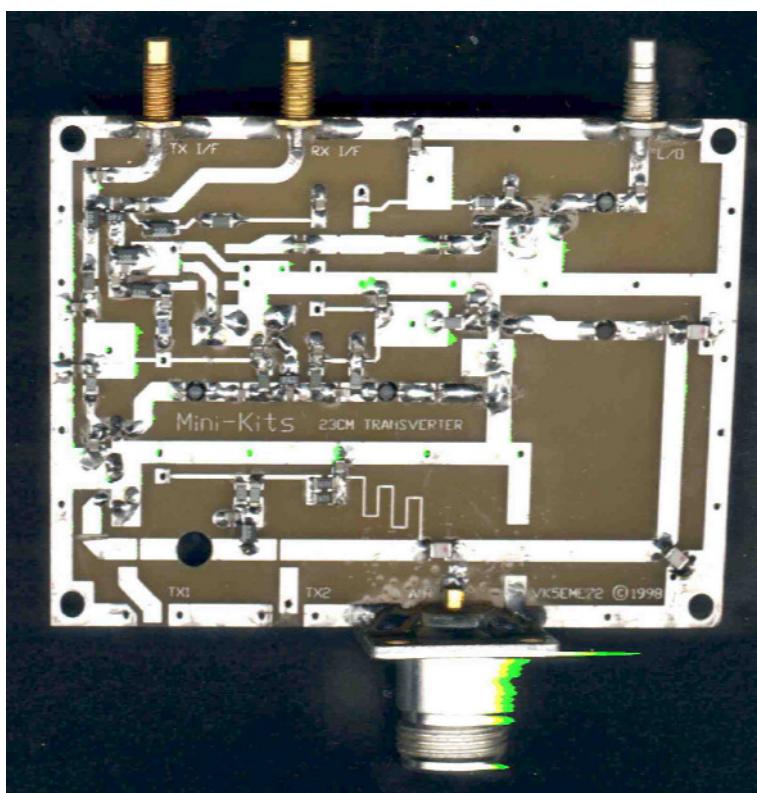
high. See [www.downeastmicrowave.com](http://www.downeastmicrowave.com) and [www.db6nt.com](http://www.db6nt.com)

Minikits. A company run by Mark VK5EME ([www.minikits.com.au](http://www.minikits.com.au)) produces a 1296 MHz Transverter kit at reasonable cost. The complete system consists of the main Transverter PCB, plus associated PCB's such as the local oscillator, IF switching, etc. A 18 watt Power Amplifier kit is also available at very reasonable cost. A number of stations such as Simon, ZL1SWW and Harry ZL1BK have used this transverter as the basis for their equipment.

This image is of the track side of a Minikits 1296 MHz Transverter model EME72. The SMD components are fitted on this side, and four small helical filters (~10mm sq) are placed on the other side. The helical filters require virtually no tuning so make construction and alignment very easy. A later version of this board, replaces the 1<sup>st</sup> RF stage MMIC (RX) with a GaAsfet. This increases

the sensitivity a few dB.

The EME65 local oscillator @ 576 MHz feeds the coax connector at top right. The connectors on the left are for separate IF TX and RX signals.



The IF and RF signals are switched via PIN diodes. A separate board provides TX IF attenuation and DC switching and sequencing.

The PCB has some minor changes as it drives a separate discrete amplifier. ( missing MMIC/hole on lower left.) The output from this particular PCB is only a few mW, whereas the standard configuration is several 10's of mW so that a Mitsubishi MOSFET Power Module can be driven.

Minikits also has developed a PCB which uses a low cost RF relay to switch up to maximum of 10 watts at 1296 MHz.

All that is needed is a 2M transceiver in the 0.5 to 10 watt range. Typically FT290/IC202/FT817/etc are used. SSB activity is around 1296.200 MHz.

During contests there is significant activity on 1296 MHz. During the last contest, Dave ZL1AKW in Tauranga worked many stations in the Auckland area.

Remember that 1296 MHz contact I had a few years back. From the South shore of Lake Taupo to Steve, ZL1TPH Moirs Hill, North of Auckland. (nearly 300 km under normal conditions).

From an average QTH in Hamilton, the editor has heard weak carriers from Nick ZL1IU, near the Bay of Islands, and signals from Maunganui Bluff.

There are many reports of long distances worked on the Microwave bands.

One just needs stations at both ends... More activity on the bands.

Why don't YOU give the Microwave bands a go!!

Contact Kevin at [rfman@xtra.co.nz](mailto:rfman@xtra.co.nz) if you have any inquiries or material for this newsletter.